ber, beginning with an era now nearly seven thousand years ago. For example, January 1, 1911, will be Julian Day 2,419,038. The interval between any two dates, one reckoned by the old calendar, the other by the new, may be easily found when their Julian numbers are known, and these may be found or calculated from almanacs.

9. It is greatly to be hoped that, if a reform is made in the calendar, we shall adopt the plan of naming the hours in the day up to 24, so as to avoid the useless writing of A.M., P.M., M., and the like, after the hour. In Italy, for example, this simple plan is followed with the best results.

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SCIENTIFIC BOOKS

Physical Science in the Time of Nero: Being a translation of the Quæstiones Naturales of Seneca. Pp. liv + 368. London, Macmillan & Co. 1910.

As the work of the most distinguished thinker, and writer of his time, the "Quæstiones Naturales" of Seneca (3–65 A.D.) commands attention; and as a landmark in the progress of human knowledge, it is of permanent interest. In this volume of 368 pages, the Roman philosopher did for his day what Aristotle had done four centuries earlier in his physical and meteorological treatises. Seneca records the observations of previous writers, adds many of his own and discusses all from the lofty plane of the philosopher and moralist.

This was only natural, as there was no school of experimental science in Athens, Alexandria or Rome in the lifetime of Seneca. Indeed, many a century had to pass before the inquirer into the phenomena and laws of nature condescended to measure and weigh, to use his hand as well as his intellect.

The Greek mind had for abstract truth a marked fondness which was unfavorable to such drudgery as manipulation; the Roman, while less subtle and more practical, also showed a decided preference for general observation and philosophical speculation.

Aristotle and his disciple Theophrastus were the authoritative masters of the physical knowledge of Greek and Roman antiquity; and to them Seneca frankly acknowledges his indebtedness. But if from their pages on meteorology, astronomy and physical geography, he borrows the substance of some of his chapters, a perusal of the seven books which compose the "Quæstiones Naturales," will show that he has a clear way of describing the phenomena of nature and an insistent way of presenting his explanations and defending his opinions regarding them.

In the original, the work was divided into eight books which, in course of transcription, was reduced to seven by the union (probably) of Books II. and III.

Book I. treats of the rainbow, halos and mock suns; Book II., of lightning and thunder; Book III., of the forms of water; Book IV., of snow, hail and rain; Book V., of winds and general movements of the atmosphere; Book VI., of earthquakes, and Book VII., of comets.

In discussing the rainbow, Seneca remarks that it may be seen at night as well as during the day, provided the moon is unusually bright, to which he adds that the rainbow colors are the same as those which are seen by holding a glass rod obliquely in the path of the sun's rays. The magnifying power of a spherical water-lens did not escape his observant eye; for he says that "letters, however small and dim, are comparatively large and distinct when seen through a glass globe filled with water."

In treating of earthquakes, he recognizes three kinds of movements, viz., the *quaking* "when the earth is shaken and moves up and down"; the *tilting* "when, like a ship, it leans over to one side," and the *quivering* when "no great damage is usually done." He also adds the just observation that maritime districts are those which are most frequently shaken.

In his book on comets, he affirms that a comet is not "a sudden fire, but one of nature's permanent creations"; and he does not hesitate to berate one Ephorus for saying that a certain great comet which had been "carefully watched by the eyes of the whole world and which drew issues of great moment in its

train" broke up and "was resolved into two parts."

Ephorus may have been right despite the caloric statement of Seneca; for, in our own times, we have witnessed the disruption of Biela's comet and have assurance of the disintegration of scores of others.

One is not surprised to read of nature's abhorrence of a vacuum; but even an ardent admirer of Seneca would hardly expect to find a reference to the doctrine of the conservation of matter (p. 121) or to the effect of forest denudation on the amount of rain-fall and on the character of floods (p. 122).

Though the rotation of the earth upon its axis and its revolution around the sun had been advanced by several Greek astronomers to explain the phenomena of day and night Seneca seems to cling to the old belief of a stationary earth and a revolving starry dome.

The "Quæstiones Naturales" was written in the last year or so of a life that was busy intellectually and troublous politically; for if Nero was a docile student, he showed himself afterward an ungrateful pupil as well as a ruthless tyrant. One may well wonder how Seneca found the time and tranquility needed to add the present scientific treatise to his numerous writings dramatic, philosophical and moralistic.

Throughout these pages, Seneca shows a keen appreciation of the value of observation for the extension of our knowledge of the world around us, and also of the importance of common sense in the interpretation of our observations.

To this translation in fine literary English, Professor Clarke has prefixed a life (54 pages) of the Roman sage, and Sir Archibald Geike, President of the Royal Society, has appended a valuable analysis (23 pages) of each of the seven books. This critical analysis from a master pen gives by itself a good idea of what was known in physical science in the time of the Emperor Nero.

Brother Potamian
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Allen's Commercial Organic Analysis. Vol. II., Fixed Oils, Fats, Waxes, etc. Fourth edition, entirely rewritten. Edited by Henry Leffmann and W. A. Davis. Philadelphia, P. Blakiston's Son and Co. 1910. Pp. x + 520. Price $5.00 Vol. III., Hydrocarbons, Asphalt, Phenols, Aromatic Acids, Modern Explosives. Pp. x + 635. Price $5.00.

As with the first volume, which was reviewed in Science a few months ago, these volumes have been so entirely rewritten as to form practically new books. As with that the different chapters have been written by experts in the different fields. In Volume II. the authors are: Fixed Oils, Fats and Waxes, C. Ainsworth Mitchell; Special Characters and Methods (Olive Oil Group, Beeswax, etc.), Leonard Aschbutt; Butter Fat, Cecil Reeves and E. R. Bolton; Lard, C. Ainsworth Mitchell; Linseed Oil, C. A. Klein; Higher Fatty Acids, W. Robertson; Soap, Henry Leffmann; Glycerol, W. A. Davis; Cholesterols, John Addyman Gardner; Wool Fat, Cloth Oils, Augustus H. Gill. In Volume III., Hydrocarbons, F. C. Garrett; Bitumens, S. S. Sadtler; Naphthalene and its Derivatives, W. A. Davis; Anthracene and its Associates, S. S. Sadtler; Phenols, S. S. Sadtler; Aromatic Acids, Edward Horton; Gallic Acid and its Derivatives, W. P. Dreaper; Phthalic Acid and the Phthaleins, W. A. Davis; Modern Explosives, A. Marshall; Table of Comparison for Centigrade and Fahrenheit Degrees.

The methods of analysis for complex mixtures of organic compounds are almost unlimited in their variety and make use of all kinds of physical and chemical properties. A book which brings together the best of these methods and which is filled with copious references to the literature of the subjects considered is indispensable in every laboratory where such products are examined. This revision of Allen's well-known book under the editorship of Leffmann and Davis and with the collaboration of well-selected experts meets this need excellently.

W. A. Noyes

Scientific Journals and Articles

Terrestrial Magnetism and Atmospheric Electricity for September contains the follow-